What is claimed is:

1. A method for forming a wafer of a compliant composite substrate, comprising the steps of:

a) selecting a first substrate material having a melting point of T_{m1};

b) selecting a second substrate material having a melting point of T_{m2};

c) selecting a joint metal with a melting point of T_m; wherein

i) said joint metal and said first substrate material form a first eutectic alloy at a first eutectic temperature T_{eu1} while said joint metal and said second substrate material form a second eutectic alloy at a second eutectic temperature T_{eu2}; and

ii) T_{m1} and $T_{m2} > T_m > T_{eu1}$ and T_{eu2};

d) depositing said joint metal on a side of said first substrate material to form a first intermediate substrate;

e) depositing said joint metal on a side of said second substrate material to form a second intermediate substrate;

f) forming a substrate pair by combining said first and second intermediate substrates such that said sides of said first substrate material and said second substrate material having said joint metal on them are against each other;

g) ramping a temperature of said substrate pair up to at least T_m, whereby said temperature passes through T_{eu1} and T_{eu2}; and

h) cooling, after step (g), said substrate pair to form said compliant composite substrate.

2. A method according to claim 1, further comprising enhancing adhesion between said first and second intermediate substrates by preliminarily bonding said substrate pair.

3. A method according to claim 1, wherein the steps of ramping and cooling are conducted in a high vacuum.

4. A method according to claim 1, further comprising soaking said substrate pair, after step (g) and before step (h), for a specified period of time.

5. A method according to claim 1, further comprising forming a protective layer, before step (d), on said second substrate material on which epitaxial layers are to be grown.

6. A method according to claim 1, wherein said first substrate material is Ge and said second substrate material is Si.

7. A method according to claim 6, wherein said joint metal is Al + 1% Si.

8. A method according to claim 1, further comprising selecting a first thickness of said joint metal deposited in step (d) and a second thickness of said joint metal deposited in step (e) such that a total thickness (t) of said joint metal is the sum of said first thickness and said second thickness, and said total thickness (t) satisfies an equation $t \geq D\, \Delta\alpha / \alpha \times 10^{-4}$, where D is a dimension of said wafer, and $\Delta\alpha / \alpha$ is a ratio of a thermal mismatch between Sub1 and Sub2 which equals $|(\alpha_1 - \alpha_2)| / 1/2\,(\alpha_1 + \alpha_2)$.

9. A method according to claim 8, further comprising selecting α_{eff} such that α_{eff} is approximately equal to a thermal expansion coefficient of an epitaxial layer to be grown on said composite substrate.

10. A method according to claim 1, further comprising selecting a first thickness of said first substrate material and a second thickness of said second substrate material such that:

$$\alpha_{eff} = (\alpha_1 t_1 + \alpha_2 t_2) / (t_1 + t_2)$$

where α_{eff} is a thermal expansion coefficient of said composite substrate, α_1 is a thermal expansion coefficient of said first substrate material, α_2 is a thermal expansion coefficient of said second substrate material, t_1 is said first thickness of said first substrate material, and t_2 is said second thickness of said second substrate material.

11. A method according to claim 10, further comprising selecting α_{eff} such that α_{eff} is approximately equal to a thermal expansion coefficient of an epitaxial layer to be grown on said composite substrate.

12. A method according to claim 1, further comprising selecting said first substrate material and said second substrate material such that:

$$\alpha_{eff} = (\alpha_1 t_1 + \alpha_2 t_2) / (t_1 + t_2)$$

where α_{eff} is a thermal expansion coefficient of said composite substrate, α_1 is a thermal expansion coefficient of said first substrate material, α_2 is a thermal expansion coefficient of said second substrate material, t_1 is said first thickness of said first substrate material, and t_2 is said second thickness of said second substrate material.

13. A method according to claim 12, further comprising selecting α_{eff} such that α_{eff} is approximately equal to a thermal expansion coefficient of an epitaxial layer to be grown on said composite substrate.

14. A compliant composite substrate formed by the method of claim 1.

15. A compliant composite substrate formed by the method of claim 8.

16. A compliant composite substrate formed by the method of claim 10.

17. A compliant composite substrate formed by the method of claim 12.